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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

Amendment of Parts 2, 15, and 97 of the
Commission's Rules to Permit Use of Radio
Frequencies Above 40 GHz
for New Radio Applications

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ET Docket No. 94-124
RM-8308

TO: The Commission

**PETITION FOR RECONSIDERATION OF
CUTLER-HAMMER, INC.**

CUTLER-HAMMER, INC.

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SUMMARY

Cutler-Hammer, Inc., a manufacturer of sophisticated sensors used in automated industrial applications, seeks limited reconsideration of the Commission's decision allocating the 59-64 GHz band for unlicensed use under Part 15. Specifically, we request that the Commission modify its rules to permit fixed field disturbance sensors to operate in the band. In addition, Cutler-Hammer asks that the Commission take steps to ensure that use of the 59-64 GHz band is not unduly delayed by the process of developing spectrum etiquette techniques.

The 59-64 GHz band provides a perfect match for the requirements of advanced sensor design. Because the frequency is higher than those at which sensors currently operate, "millimeter wave" sensors can be designed to fit into smaller packages. The technology will also permit increased sensing accuracy, particularly at short distances, and greater reliability, especially in dusty, foggy or humid environments.

The prohibition on the use of this band by field disturbance sensors is unnecessarily broad and not supported by the record. Some commenting parties objected to proposed vehicle radar operations in the 59-64 GHz band, suggesting that such operations would interfere with broadband data communication applications. However, no party expressed concern about non-mobile sensors. These sensors would operate at a much lower power than vehicle radar and would be installed in fixed locations. In addition, they would be designed to operate in industrial environments where it is unlikely that broadband communication devices

would be needed or used. Thus, fixed sensor operations can clearly co-exist with other applications in the 59-64 GHz band and should be permitted.

Cutler-Hammer also requests that the Commission adopt specific dates by which the rule permitting operation in this band would go into effect, rather than suspending the rule until the Commission acts with respect to spectrum etiquette techniques. Cutler-Hammer has no objection to the development of spectrum etiquette policies; to the contrary, we intend to participate fully in that process. Our only concern is in avoiding delay in the event that negotiations regarding spectrum etiquette fail to produce an acceptable result. Accordingly, we request that the Commission permit operations in the 59-64 GHz band (1) effective January 1, 1997 if industry has not agreed to spectrum etiquette techniques by that date or (2) effective June 1, 1997 if spectrum etiquette rules have not been adopted by the Commission.

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CUTLER-HAMMER, INC.**

Cutler-Hammer, Inc. ("Cutler-Hammer"), by its attorneys and pursuant to Section 1.429 of the Commission's Rules, 47 C.F.R. § 1.429, hereby submits this petition for reconsideration of the *First Report and Order* in the above-captioned proceeding, FCC 95-499, released Dec. 15, 1995, 61 *Fed. Reg.* 14500 (Apr. 2, 1996) ("*Order*"). Specifically, Cutler-Hammer seeks modification of the rules adopted in the *Order* to permit the operation of fixed field disturbance sensors in the 59-64 GHz band. Furthermore, Cutler-Hammer seeks clarifying changes in the rules to ensure that development of spectrum etiquette does not unduly delay the commencement of sensor operations in this band. The specific modifications Cutler-Hammer proposes to the language of the rules are set out in Exhibit A.

BACKGROUND

Cutler-Hammer develops, manufactures and markets sensors for industrial applications both domestically and internationally. Sensors play a critical role in today's automated plants, allowing manufacturers to address a range of requirements including operator safety, quality control, optimized production yields and improved productivity. Sensors perform these functions by acting as remote "eyes," providing data on the presence, position, color and motion of objects, or as "feelers," that can report on pressure, temperature, and humidity. For example, a metal stamping machine in an automobile assembly line might have position sensors installed in its guard doors that keep the machine from being turned on unless the doors are closed, preventing the machine's operator from getting too close to the stamping mechanism.

As industry relies more heavily on increasingly sophisticated automation techniques, demand for smaller, more accurate and more reliable sensors also increases. Because automation equipment such as machining centers and transfer lines are designed to be compact, such sensors must also be capable of providing accurate data within a very close range. These constraints led Cutler-Hammer to focus on developing a device that would operate at a frequency above 35 GHz, to reduce the size of the device, with a bandwidth of 5 GHz to eliminate standing wave problems in the near field region. After preliminary discussions with Commission staff, Cutler-Hammer began to look closely at the possibility of

using millimeter wave technology for these sensors and operating in the 59-64 GHz band that the Commission had proposed to allocate for unlicensed use.

Unfortunately, by the time Cutler-Hammer began to study the possibility of sensor operations in the 59-64 GHz band, the comment and reply comment periods regarding the Commission's proposal had expired. As a result, Cutler-Hammer did not have the opportunity to participate as a commenting party.¹ However, Cutler-Hammer reviewed the *Notice* and the submissions of other parties and began monitoring the proceeding. Based on that review, it appeared that the Commission's proposals and the positions of the parties were consistent with Cutler-Hammer's planned use of the 59-64 GHz band for fixed sensors.

Cutler-Hammer now seeks limited reconsideration of the *Order* because the rules as adopted would unnecessarily preclude sensor operations. Unless the rules are modified, they will needlessly limit the uses of the 59-64 GHz band, preventing introduction of a valuable application of millimeter wave technology.

Specifically, Section 15.255 provides that operation within the 59-64 GHz band is "not permitted for field disturbance sensors, including vehicle radar

¹ Because Cutler-Hammer did not begin assessing the feasibility of sensor operations in this band until after the comment periods in response to the *Notice* had passed, consideration of Cutler-Hammer's reconsideration petition is consistent with Section 1.429(b) of the Commission's rules. That provision permits a reconsideration petition to rely on facts that have not previously been presented to the Commission if the facts relate to events that occurred after the last opportunity to present them to the Commission. Consideration of the benefits of permitting fixed sensor operations in the 59-64 GHz band is also required by the public interest because of the benefits of advanced sensor performance discussed below.

systems.” *Order* at 45, § 15.255(a). As discussed below, this language is overbroad and unnecessary. A number of parties expressed concern about suggestions that vehicle radar be permitted to use the 60-61 GHz band. However, to Cutler-Hammer’s knowledge, no party objected to operations by other types of field disturbance sensors, such as the fixed industrial sensors Cutler-Hammer is developing. Operation of these sensors does not pose an interference risk to other applications that have been proposed for the 59-64 GHz band, so modification of the Commission’s rules to permit these sensors is completely consistent with the Commission’s policy goals.

In addition, Cutler-Hammer seeks a limited modification of the suspension of the rules relating to the 59-64 GHz band pending action on spectrum etiquette techniques. Cutler-Hammer has no objection to the concept of a spectrum etiquette and in fact intends to participate with industry members in developing spectrum etiquette parameters. However, Cutler-Hammer requests that the Commission take action to ensure that the process of arriving at spectrum etiquette techniques does not unduly delay the implementation of the 59-64 GHz band. Specifically, the Commission should provide that operations in the 59-64 GHz band will be permitted (1) effective January 1, 1997 if industry has not agreed to spectrum etiquette techniques by that date or (2) effective June 1, 1997 if spectrum etiquette rules proposed by industry have not been adopted by the Commission. This minor procedural change will save the Commission the administrative burden

of a further Order to place the rules in effect. More importantly, this change will expedite important service to the nation's manufacturing industries.

**I. MODIFICATION OF SECTION 15.255 IS
NECESSARY TO PERMIT VALUABLE FIXED
SENSOR OPERATIONS IN THE 59-64 GHZ BAND**

The limited reconsideration of the *Order* sought by Cutler-Hammer here is needed to allow use of the 59-64 GHz band by fixed sensors that can play a critical role in automated production environments. The record before the Commission does not provide a basis for prohibiting fixed sensor operations, which will not pose an interference risk to the broadband communications applications proposed for this band. Furthermore, introduction of stationary field disturbance sensors should not be unduly delayed pending adoption of spectrum etiquette techniques.

**A. Millimeter Wave Technology Will Permit
Important Advances in Fixed Sensor Operations**

Allowing fixed field disturbance sensors to operate in the 59-64 GHz band will yield significant benefits by promoting enhanced sensor performance. As noted above, sensors are essential to modern automated production plants. It is not uncommon for such plants to spend \$1 million on sensors alone when a new automation line is established.

The data provided by sensors permit increased safety and improved productivity. Sensors give the control system the means to constantly monitor the proper functioning of the production line. Managers then can ensure that quality

standards are maintained and conditions that might pose a threat to operator safety are identified quickly. To perform these functions, customers require sensors that can provide a high level of accuracy and reliability in a compact package.

Millimeter wave technology provides an important tool to improve sensor performance. Current sensor technologies are limited in their ability to perform speed control, fluid level and motion detection functions because humidity, fog or dust can interfere with their ability to provide the control system with accurate data. Millimeter wave sensors can overcome these limitations because they are not as susceptible to these environmental factors. Millimeter wave technology also permits precision speed detection using “Doppler” techniques. In addition, millimeter wave devices can provide greater sensor accuracy and distance in a smaller package because they operate at higher frequencies. Because of the increased interest in developing applications at these frequencies, costs of millimeter wave components have declined to the point where this technology can compete with existing products.

Millimeter wave devices will be particularly useful in the compact designs of modern automation lines. Cutler-Hammer expects that sensor applications will typically require a sense range of less than 2 feet, with a need for accurate measurements within 6 inches. This close range requires operations using directed low power radiation in the near field. Furthermore, to overcome standing wave interference in the near field, wide operational bandwidth is necessary.

Finally, because of the potential volume of demand for these devices, operating in a licensed band would be impractical.

The 59-64 GHz band allocated in the *Order* for unlicensed Part 15 devices provides a perfect match for the technical requirements of advanced fixed field disturbance sensors. It will permit compact design, wide band operations, and marketing on an unlicensed basis. Allowing sensor applications in this band will therefore permit Cutler-Hammer and other manufacturers to meet the growing demand for sophisticated sensors by designing innovative new products tailored to the needs of today's automated production lines. Cutler-Hammer is prepared to act expeditiously to bring such sensors to market as soon as the Commission acts to modify the rules.

B. The *Order's* Ban on Fixed Sensor Operations in the 59-64 GHz Band Is Unnecessary and Unsupported by the Record

Permitting fixed field disturbance sensors to operate in the 59-64 GHz band is completely consistent with the Commission's goals and with the record in this proceeding. Fixed sensors do not pose an interference threat to other proposed applications in this band, so there is no technical reason to prohibit their use.

The Commission did not propose any restriction on the types of applications that would be permitted in this band in the *Notice*.² Instead, proposed Section 15.253 indicated only that operation in any of the millimeter wave bands

² *Notice of Proposed Rule Making*, ET Docket No. 94-124, 9 FCC Rcd 7078 (1994).

being considered by the Commission was not permitted on aircraft. *Id.* at 7106, § 15.253(a).

Similarly, neither the comments filed in response to the *Notice* or the *Order* itself provide a basis for prohibiting operation by fixed sensors. Instead, the concerns of commenting parties and the analysis in the *Order* focused only on the incompatibility of mobile vehicle radar operations with the broadband data communications operations proposed for the 59-64 GHz band.³

There was no suggestion in the comments or the *Order* that similar concerns would apply to operation of fixed field disturbance sensors. In fact, sensors of the type being developed by Cutler-Hammer are very different from vehicle radar devices and are completely compatible with data communication operations.

First, because vehicle radar systems are mobile, the potential for interference from them to fixed operations is hard to predict and to protect against.

³ Certain parties had suggested that the 60-61 GHz band be allocated for vehicle radar, noting that this spectrum has been assigned to vehicle radar development in Japan. In response, a number of parties supporting the use of the 59-64 GHz band for wide band data transmissions expressed concern about the potential for interference from vehicle radar operations. *See Order* at 7, citing comments of AT&T, Hewlett-Packard, and the Millimeter Wave Advisory Group. These parties also noted that allowing use of the 60-61 GHz band for vehicle radar would break up the proposed 59-64 GHz band into two smaller, less useful bands.

The Commission agreed that breaking up the band by allowing for exclusive vehicle radar operations at 60-61 GHz would impede development of novel broadband communications applications. *Order* at 7. In addition, the Commission determined that sharing between vehicle radar and other services was not feasible. Accordingly, the Commission rejected the requests that the 60-61 GHz band be authorized for vehicle radar. *Id.*

The effect is like shining a flashlight around in different directions -- the source and direction of the radiation pattern will vary based on the path the vehicle is taking. In contrast, the fixed sensors that Cutler-Hammer is designing would create a predictable radiation pattern, permitting them to be designed and installed in such a way that they would neither be susceptible to or likely to cause harmful interference.

In addition, the sensors would operate at power levels that would be much lower than those permitted for vehicle radar devices. In fact, the sensors would typically operate at a power density of no more than 200nW/cm² at a distance of 3 meters. This represents a power level approximately 25 dB below the maximum power density permitted under the *Order* for forward-looking vehicle radar devices when the vehicle is in motion. *See Order* at 43-44, § 15.253(b).

Because of these critical differences, fixed field disturbance sensors of the type proposed by Cutler-Hammer do not pose a threat of harmful interference to other applications in the 59-64 GHz band. The sensors are designed for fixed use in an environment in which it is quite unlikely that broadband data communications devices would be operating. Specifically, the sensors are needed for installation in automated production equipment on the factory floor. This is an extremely harsh environment, characterized by the presence of dust, extreme temperatures, caustic chemicals, and electrical noise from motors and solenoids. This is not a setting that would be conducive to the operation of sophisticated wideband data links, or in which such communications would normally be required.

The likelihood that sensor operations would interfere with data transmissions would be remote in any event. Because of the numerous obstacles present on the factory floor, point-to-point data communications devices could operate only if they were installed high above the production equipment to get a clear path. Millimeter wave sensors, on the other hand, would be installed inside the production machinery, resulting in several reflections of the signal before any wave propagation would exit the machine. As discussed above, the sensors would also operate at a power level much lower than that of vehicle radar, and lower than the limits adopted for the 59-64 GHz band as well. *See Order* at 45, § 15.255(b). As a result, it is extremely unlikely that emissions from the sensors would be strong enough to interfere with data operations, given the signal attenuation characteristics of the oxygen absorption band. *See id.* at 4 n.6.

Because the sensors proposed by Cutler-Hammer would operate at a low power, fixed inside automation equipment, and within the walls of the harsh industrial environment, the possibility that reflected power would escape the manufacturing floor to interfere with broadband communications is minimal. Thus, unlike vehicle radar, fixed field disturbance sensors can clearly co-exist with the data communication applications being developed for the 59-64 GHz band.

**C. Introduction of Fixed Field Disturbance Sensors
Should Not Be Unduly Delayed by Efforts to
Develop Spectrum Etiquette Techniques**

Cutler-Hammer also seeks a limited modification of the suspension of the rule permitting operations in the 59-64 GHz band pending final Commission

action regarding spectrum etiquette techniques. Cutler-Hammer emphasizes that it has no objection to the development of spectrum etiquette *per se*. To the contrary, Cutler-Hammer has already had a number of contacts with industry members active in the development of spectrum etiquette for the band, and we are prepared to participate fully in that process ourselves.

Our concern, though, is that this process not be permitted to unduly delay the introduction of valuable new sensor designs. Cutler-Hammer is prepared to finalize its design for millimeter wave sensors and begin production as soon as the rules are modified to permit such sensors. Furthermore, for the reasons discussed above, our sensors will not present an interference risk to data communications devices, so implementation of spectrum etiquette is not needed to ensure that sensors can co-exist with broadband applications.

Unfortunately there will now be some delay before Cutler-Hammer can go forward due to the need for Commission action to reconsider the prohibition on fixed field disturbance sensors. Cutler-Hammer will not seek here a determination that sensor operations should be permitted to proceed without regard to the spectrum etiquette process. As noted above, we intend to participate fully in that process, which we hope will move forward quickly to a successful outcome. However, we are concerned about the potential for delay if disagreements arise, particularly because as the rule now stands, affirmative Commission action is required to lift the suspension and allow use of the 59-64 GHz band.

Therefore, Cutler-Hammer requests that the Commission incorporate specific expiration dates for the suspension of the rule permitting operations in the 59-64 GHz band. The suspension should expire automatically (1) on January 1, 1997 if industry attempts to develop a spectrum etiquette proposal have not succeeded or (2) on June 1, 1997 if final spectrum etiquette rules have not been adopted by the Commission.

This approach is consistent with the Commission's statement in the *Order* that it does not "intend to delay implementation of the 59-64 GHz band for an extensive period of time." *Order* at 28. In addition, it is consistent with the representations of spectrum etiquette proponents, who we understand have committed to completing their negotiations by mid-December of this year. The deadlines Cutler-Hammer has proposed simply would eliminate the need for affirmative Commission action to permit the rule allowing operations in the 59-64 GHz to go into effect if the etiquette negotiations fail to produce an acceptable result.

Again, Cutler-Hammer's only objective here is to be in a position to bring a valuable new sensor technology to market as quickly as possible. Our ability to do so will be delayed in any event while the Commission considers our request for reconsideration of the overbroad language in Section 15.255(a) barring use of fixed as well as mobile field disturbance sensors. However, once that issue is resolved, we do not believe we should be subject to further delay if there has been a

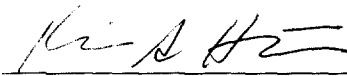
breakdown in the process of developing spectrum etiquette techniques for data communications devices.

CONCLUSION

For the foregoing reasons, Cutler-Hammer respectfully requests that the Commission modify the rules adopted in the *Order* to permit the expeditious introduction of fixed sensor devices in the 59-64 GHz band.

Respectfully submitted,

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May 2, 1996

EXHIBIT A

Cutler-Hammer respectfully requests that on reconsideration, the Commission modify Section 15.255 as follows:

Section 15.255 Operation within the band 59.0-64.0 GHz.

NOTE: Equipment may ~~not~~ be operated under the provisions of this section ~~(a) effective on January 1, 1997 if the industry has not filed a specific proposal for spectrum etiquette standards by that date, or (b) effective on June 1, 1997 if the Commission has not adopted rules implementing spectrum etiquette by that date, until a final Commission decision is reached concerning appropriate spectrum etiquette techniques.~~

(a) Operation under the provisions of this section is not permitted for mobile field disturbance sensors, including vehicle radar systems, nor is the operation of this equipment permitted on aircraft or satellites.

CERTIFICATE OF SERVICE

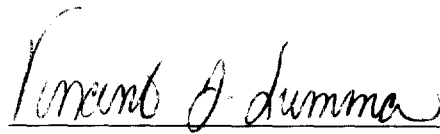
I hereby certify that copies of the foregoing Petition for Reconsideration of Cutler-Hammer, Inc. were served by hand delivery this 2nd day of May, 1996 to:

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